REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have cancelled claim 1 without prejudice or disclaimer, and have substituted therefor new claim 18. Claim 18 recites subject matter of original claim 1, and, additionally further defines the component (c) (latent acid generator which generates acid upon heating), consistent with the description, for example, on pages 26-28 of the Substitute Specification submitted as part of the Preliminary Amendment filed April 20, 2006, in the above-identified application, upon original filing thereof (hereinafter "Substitute Specification").

Claim 7 has been cancelled without prejudice or disclaimer, and new claim 19 substituted therefor. Claim 19 is in independent form, reciting a positive photosensitive resin composition including components (a)-(c) in original claim 1 and component (d) as in claim 7, claim 19 further defining the component (d) as a compound represented by the general formula (II), as recited in original claim 8. In light of new claim 19, claim 8, in addition to claim 7, has been cancelled without prejudice or disclaimer.

Claim 12 has been cancelled without prejudice or disclaimer, and new claim 20 substituted therefor. Claim 20 recites a method including a step of applying a positive photosensitive resin composition onto a supporting substrate and drying the composition, exposing the resulting photosensitive resin film to a ray of active light and developing the exposed photosensitive resin film using an alkaline aqueous solution, and subjecting the developed photosensitive resin film to a heating treatment, claim 20 defining the positive photosensitive resin composition as including the components (a)-(c) of original claim 1, with the latent acid generator being further defined as a generator

having a decomposition starting temperature of 140°-250°C, and wherein the heating treatment is defined as being conducted at a temperature equal to or lower than 280°C. See, e.g., page 24 of Applicants' Substitute Specification; and note also page 35 thereof.

In light of new claims 18-20, and cancelling of previously considered claims 1, 7 and 12, respectively, dependencies of various of the original claims have been amended; and claims 13 and 15 have also been cancelled without prejudice or disclaimer, in light of new claim 20.

In addition to claims 18-20, Applicants are also adding claims 21-23 to the application. Claim 21, dependent on claim 19, defines the component (a) as set forth expressly in claim 2. Claim 22, also dependent on claim 19, defines the decomposition starting temperature of the component (c), as set forth in claim 20. And claim 23, dependent on claim 19, defines amounts of components (b) and (c) relative to amount of component (a), as in claim 10.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting the claims in the Office Action dated June 28, 2007, that is, the teachings of the U.S. patent documents to Fujita, et al., Patent Application Publication No. 2005/0014876, and to Nunomura, et al., Patent No. 6,232,032, under the provisions of 35 USC 102 and 35 USC 103.

Initially, attention is respectfully directed to the number for Fujita, et al., set forth in Item 2 on page 2 of the Office Action dated June 28, 2007 (that is, "2005/0014873"). However, it is respectfully submitted that the correct number for Fujita, et al. is

No. 2005/0014876, as in the Information Disclosure Statement submitted April 20, 2006, upon originally filing the above-identified application. Clarification of the number of Fujita, et al. being applied in rejecting claims in the Office Action dated June 28, 2007, is respectfully requested; in any event, in order to facilitate proceedings, and noting that the application published as No. 2005/0014873 does not name Fujita as an inventor, and is directed to different subject matter, the following comments are directed to the aforementioned Patent Application Publication No. 2005/0014876 of Fujita, et al.

It is respectfully submitted that the teachings of the documents applied by the Examiner would have neither disclosed nor would have suggested such a positive photosensitive resin composition as in the present claims, having the components (a)-(c), including the latent acid generator which generates acid upon heating, as component (c), and wherein this component (c) is selected from the group consisting of (c-1) through (c-4), and combinations thereof, as in claim 18.

Furthermore, it is respectfully submitted that the teachings of the references as applied by the Examiner would have neither disclosed nor would have suggested such a positive photosensitive resin composition as in the present claims, including the components (a)-(d), the component (d) being a compound represented by the general formula (II) as in claim 19.

Additionally, it is respectfully submitted that these references as applied by the Examiner would have neither disclosed nor would have suggested such a method for forming a pattern as in the present claims, including, in additional to applying a positive photosensitive resin composition and drying the composition to obtain a photosensitive resin film, and exposing the film to a ray of active light and developing the exposed resin

film using an alkaline aqueous solution, wherein the developed photosensitive resin film is subjected to a heating treatment, the heating treatment being conducted at a temperature equal to or lower than 280°C; and, moreover, wherein the positive photosensitive resin composition includes, in addition to an alkaline aqueous solution-soluble polyamide having a polyoxazole precursor structure and an o-quinonediazide compound, a latent acid generator which generates acid upon heating, the generator having a decomposition starting temperature of 140°-250°C. Note claim 20.

Furthermore, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such composition, or such method, as in the independent claims discussed previously (that is, claims 18-20), and including additional features as in the dependent claims, such as (but not limited to) further definition of the component (a) polyamide as in claims 2 and 21; and/or wherein the component (c) (latent acid generator) is a salt formed of a strong acid and base, as in claim 3, or further definition of such salt as in claims 5 and 6; and/or wherein the component (c) has a decomposition starting temperature of 140°-250°C (see claims 4 and 22; and/or contents of the components as in claims 10, 11 and 23; and/or further definition of the heating treatment as in claim 14.

Moreover, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested such as electronic part as in the present claims, obtained by the method as in claim 20, with the pattern layer being any one of an interlayer insulating layer and a surface protecting film layer or both; or wherein such electronic part is an MRAM.

The invention according to the present invention is directed to a heat-resistant positive photosensitive resin composition containing a polyoxazole precursor having photosensitivity, as well as a method for forming a pattern using such composition and an electronic part formed having such pattern.

In recent years, as the integration degree of semiconductor devices have increased and the size thereof decreased, the resins utilized in connection therewith have more severe demands; and, in particular, there have been increasing demands on a polyimide resin, to have better mechanical properties and heat resistance. Moreover, it has been desired to use a photosensitive polyimide, which can simplify the step of forming a pattern, to shorten fabrication processes.

In various previously proposed resin compositions, various problems arise, as described on pages 2-4 of Applicants' Substitute Specification. For solving these problems, a variety of chemical amplification systems have been proposed, examples thereof including chemically amplified polyimide, and chemically amplified polyimide and polybenzoxazole precursor. However, among these, materials having high sensitivity have a low molecular weight, and hence have low film properties; and, on the other hand, materials with excellent film properties have a high molecular weight, and hence have unsatisfactory solubility and low sensitivity.

Against this background, Applicants provide a positive photosensitive resin composition, and methods of use thereof and electronic parts made therefrom, having excellent heat resistance yet which can be obtained by a low-temperature curing process, the composition providing a pattern having excellent configuration and properties, but also capable of being cured by a low-temperature process whereby

damage of the device formed can be avoided. Applicants have found that by employing a specific additive together with an alkaline-developable photosensitive polybenzoxazole precursor, a positive photosensitive resin composition is achieved which can form by a low-temperature curing process a cured film having excellent heat resistance and having physical properties comparable with those of films cured at a high temperature. Note, for example, page 6, lines 8-30 of Applicants' Substitute Specification.

That is, Applicants have found that by utilizing a composition having components as in the present claims, including the specified latent acid generator and/or the specified compound having a phenolic hydroxyl group, advantages as discussed previously are achieved.

In addition, Applicants have found that through use of the composition as in the present claims, having the latent acid generator having a decomposition starting temperature of 140°-250°C, and wherein the process for forming a pattern from the composition includes subjecting the developed photosensitive resin film to a heating treatment, the heating treatment can be conducted at a temperature equal to or lower than 280°C, so that the process is suitable for fabricating electronic parts, particularly MRAMs, required to be produced in a low-temperature process. Note e.g., page 58, lines 16-24, of Applicants' Substitute Specification.

Fujita, et al. discloses a positive photosensitive resin precursor composition, which becomes soluble in alkaline developers by being exposed to UV light, the photosensitive resin composition being described most generally in paragraphs [0010] and [0011] on page 1 of this patent publication. Note that this patent document

discloses that the resin precursor composition includes at least two photo acid generators. The photo acid generators are disclosed, for example, in paragraphs [0049] through [0065] on pages 7-13 thereof. In paragraph [0065] of Fujita, et al., it is disclosed that the constituent (c) is a compound having an alkoxymethyl group; and it is further disclosed that if the compound does not have an alkyl group, that is, if it has a methylol group instead of the alkoxymethyl group, storage stability after exposure is disadvantageously degraded.

As for use of the composition in Fujita, et al., note paragraphs [0098]-[0102] on pages 19 and 20 of this patent publication document, noting in particular the heat treatment described in paragraph [0102] on page 20. Note that in the Examples in Fujita, et al., the heating step is performed at a temperature of at least 350°C.

In connection with claim 18 and claims dependent thereon, it is respectfully submitted that Fujita, et al. would have neither taught nor would have suggested the presently claimed composition, including, inter alia, wherein the component (c) is selected from the group consisting of (c-1) through (c-4) and combinations thereof, as in claim 18. It is respectfully submitted that Fujita, et al. does not disclose any of the latent acid generators (c-1)-(c-4).

In connection with claim 19 and claims dependent thereon, it is respectfully submitted that Fujita, et al. would have neither disclosed nor would have suggested a composition including the phenolic hydroxyl-containing compound of general formula (II), in claim 19. Note that in the compound of formula (II), R_5 and R_6 are hydrogen atoms, whereas the phenolic compound disclosed in Fujita, et al. requires methoxy

groups. Clearly, Fujita, et al. would have neither disclosed nor would have suggested the composition of claim 19, and claims dependent thereon.

Moreover, it is respectfully submitted that Fujita, et al. would have neither taught nor would have suggested the method of claim 20, including use of the latent acid generator having a decomposition starting temperature of 140-250°C, with the heating treatment being conducted at a temperature equal to or lower than 280°C, and advantages thereof as discussed previously. In this regard, it is acknowledged that Fujita, et al. mentions heating temperatures in a relatively broad range, in paragraph [0102]; however, it is respectfully submitted that Fujita, et al. is silent about an acid generator as in the present claims, which enables the heating step at as low as 280°C or lower; and particularly in view of the heating step in all of the examples in Fujita, et al. being performed at 350°C or higher, Fujita, et al. would have neither taught nor would have suggested the method aspect of the present invention, and advantages thereof as discussed previously (including wherein devices which are formed at relatively low temperatures, such as MRAMs, can easily and effectively be provided at high yield).

Nunomura, et al. discloses a positive tone, heat-resistant photosensitive polymer composition capable of being converted into a heat-resistant polyimide polymer under heat, suitable for passivating films, interlayer insulating films and others for electronic parts such as semiconductor devices, the composition including (a) a polymer soluble in an aqueous alkaline solution, (b) an o-quinonediazide compound, and (c) a dissolution inhibitor for the component (a) in an aqueous alkaline solution. Note, in particular, column 2, lines 25-29. Note also column 2, lines 30-34, for preferred materials for the component (a), including a polybenzoxazole precursor soluble in an aqueous alkaline

solution; and column 2, line 50, through column 3, line 2, defining preferred dissolution inhibitors. Note also column 3, lines 57-65. See also column 7, line 63, through column 9, line 38, for various o-quinonediazide compounds. Note also, for example, from column 9, line 57, through column 10, line 63, of Nunomura, et al., for various compounds which can be used as the component (c) which is a compound effective for retarding the dissolution of the component (a) in an aqueous alkaline solution. Note also column 12, lines 19-52 of this patent, disclosing a technique for forming the composition into a pattern, including a step of heating at a temperature falling between 150 and 450°C (note especially column 12, lines 47-52). In each of the Examples in Nunomura, et al., the heating is performed at a temperature of 350°C.

It is respectfully submitted that Nunomura, et al. would have neither taught nor would have suggested such composition as in claim 18, including, inter alia, the latent acid generator (c-1) to (c-4) and combinations thereof.

Moreover, noting that the Examiner did not reject claim 7 or 8 in view of the teachings of Nunomura, et al., clearly claim 19 and claims dependent thereon patentably distinguish over the teachings of Nunomura, et al.

Furthermore, it is respectfully submitted that Nunomura, et al. would have neither taught nor would have suggested such method as in claim 20, including, inter alia, use of the latent acid generator having a decomposition starting temperature of 140-250°C, and, moreover, wherein the heating treatment is conducted at a temperature equal to or lower than 280°C, and advantages thereof.

It is acknowledged that in Nunomura, et al., heating at a relatively broad temperature of 150-450°C is described. However, it is again noted that in all of the

Examples in Nunomura, et al., the heating step is performed at 350°C, and Nunomura, et al. is silent about an acid generator as in the present claims, having the decomposition starting temperature as in the present claims. Particularly in view thereof, it is respectfully submitted that Nunomura, et al. would have neither taught nor would have suggested the method as in claim 20 or claims dependent thereon, and advantages achieved thereby, as discussed previously.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the above-identified application are respectfully requested.

To the extent necessary, Applicants hereby petition for an extension of time under 37 CFR 1.136. Kindly charge any shortage of fees due in connection with the filing of this paper, including any extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (case 1270.45867X00), and please credit any overpayments to such Deposit Account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

By **/William I. Solomon/**
William I. Solomon
Registration No. 28,565

WIS/ksh
1300 N. Seventeenth Street
Suite 1800
Arlington, VA 22209
Tel: 703-312-6600
Fax: 703-312-6666